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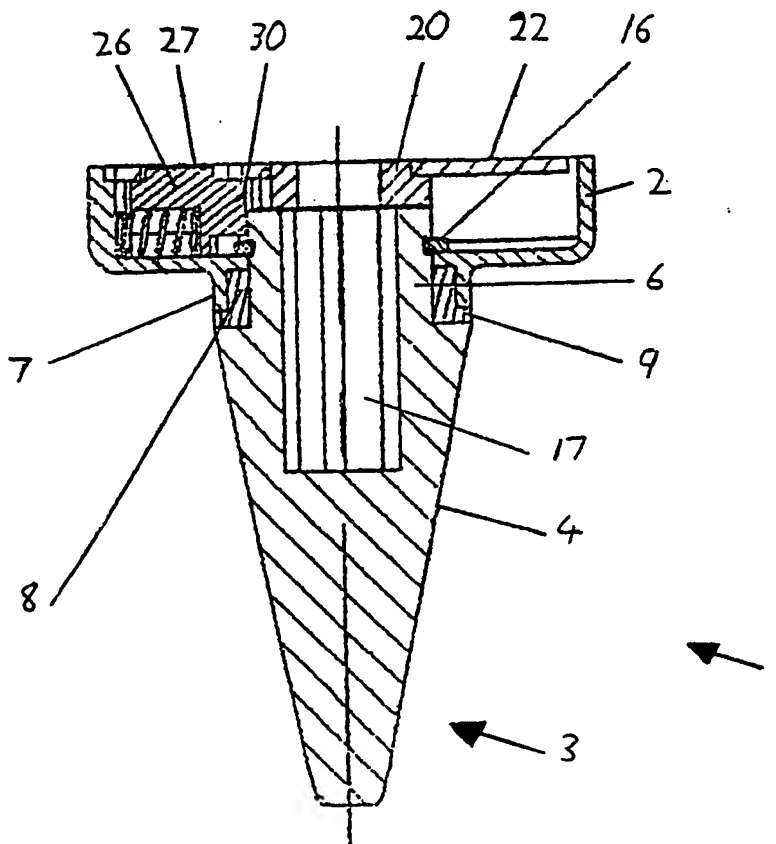
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(54) Title: DOOR LOCKING DEVICE



(57) Abstract: A locking device (1) is provided for a door latch in which a latch bar of the door latch mechanism is turnable to retract a latch bolt of the latch mechanism. A locking means is adapted to be actuated in response to turning of a door handle (3) for the latch mechanism in an anti-clockwise direction so as to lock the latch bolt in its extended latching position. It is releasable by turning the handle in the clockwise direction.

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*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

DOOR LOCKING DEVICE

The present invention relates to locking devices for door latches of the type which may be released to enable opening of a door by turning one of the associated door handles on opposite sides of the door. The locking device  
5 enables the latch to be locked in its latched position from one side of the door and prohibits the door from being opened by turning of the handle on the opposite side.

Door latches are used to retain doors, gates and the like in closed  
10 positions and, typically, comprise a spring loaded latch bolt which is resiliently urged outwardly of the latch into a latching position in which it is engageable with a retainer or catch on an adjacent door frame to latch the door in its closed position. The latch is retracted in order to permit opening of the door by turning of a square section bar which projects from opposite sides of the  
15 latch and the door and which may be turned by handles fitted to opposite ends of the bar. The handles may be knobs or lever arms. If a door having such a latch mechanism is to be locked in its latched position, the latch normally incorporates a separate key-operated bolt or, alternatively, one or both latch handles may be fitted with a complicated central locking  
20 mechanism actuated by a central push button or turnable member.

An object of the present invention is to provide a locking device for the latch bolt of a door latch, which mechanism may be actuated by a turning action of the door handle also used to retract the latch bolt for opening of an associated door.

To this end, the invention consists in a locking device for a door latch  
25 in which a latch bar of the door latch mechanism is turnable to retract a latch bolt of the latch mechanism, characterised by locking means adapted to be actuated in response to turning of a door handle for the latch mechanism in one direction so as to lock the latch bolt in its extended  
30 latching position, whereafter the locking means is releasable by turning the

handle in the opposite direction.

Preferably, the locking means, in its actuated, locking position, is arranged to act on the latch bar to prohibit turning of the latch bar. The locking means may include means turnable with the latch bar and engagable  
5 to prohibit turning of the latch bar in response to turning of the handle in said one direction, and which is disengaged by turning the handle in said opposite direction.

In one embodiment, the locking means includes a slidable locking member controlled by cam means turnable with the handle. The means  
10 turnable with the latch bar may include detent means associated with the latch bar, and the slidable locking member is engagable with the detent means for locking the latch bar against turning. The detent means may be disposed on a rotatable locking member adapted to be mounted on the latch bar so as to turn therewith.

15 It may be desirable for the cam means to be profiled to prevent the slidable locking member from engaging the detent means when the cam means is turned in said opposite direction whilst permitting the slidable locking member to engage the detent means when turned in said one direction. The cam means may have a recess which permits the slidable  
20 locking member to move into engagement with the detent means, said recess having a stop portion at one end which prevents the cam means and handle from turning further in said one direction upon engagement of the the locking member in the recess, and a ramp portion at its opposite end to ease the locking member from the recess when the handle and cam means are  
25 turned in the opposite direction. The cam means may be integral with the handle.

Conveniently, the handle is rotatably mounted in a housing for securing in a fixed position relative to the latch mechanism. The slidable locking member may be mounted in the housing.

30 The locking device desirably includes means for coupling the handle to

the latch bar, said coupling means enabling the handle to turn relatively to the latch bar, when turned in said one direction, and to turn the latch bar when turned in said opposite direction. The coupling means may comprise a passageway in the handle by which the handle is fitted to the latch bar, said  
5 passageway having an internal profile which enables the handle to turn relatively to the latch bar, when turned in said one direction, and to turn the latch bar when turned in said opposite direction.

The means for coupling the handle to the latch bar may comprises a first part associated with the handle and a second part turnable with the  
10 latch bar, so that when the handle is turned in said one direction, the coupling parts are disengaged and, when the handle is turned in said opposite direction, the coupling parts engage so that the latch bar rotates in the same direction as the handle.

Conveniently, the locking device has indexing means for indexing the  
15 door handle alternatively in either of two positions in one of which the latch bolt is locked in its extended latching position, and in the other of which the latch bolt is unlocked.

The invention may be designed as an auxiliary locking device, which may be fitted to an existing latch. In this case, the locking device with its  
20 handle is fitted in place of one of the original latch handles in order to provide the latch with a locking facility, so that a door can be locked from one side and cannot be opened by turning the latch handle attached to the latch bar on the opposite side of the door.

In another embodiment, the coupling means may comprise a  
25 passageway in the handle of rectangular cross-section and be fitting to the latch bar and wherein the latch bar has an external profile which enables the handle to turn relatively to the latch bar, when turned in said one direction, and to turn the latch bar when turned in said opposite direction.

In yet another embodiment in which the latch bar is split and  
30 comprises first and second coaxial latch bar members for projecting from

opposite sides of a door having said latch, the locking means comprises actuating members on said latch bar members, the actuating members being engageable with the latch bolt, whereby at least one of the latch bar members is rotatable in said one direction to cause its actuating member to  
5 engage the latch bolt and prohibit retraction thereof by turning of the other latch bar member.

Embodiments of the present invention will now be described, by way of example, with reference to the accompanying drawings, in which:-

Figure 1 is a plan view of one embodiment of the invention;

10 Figure 2 is a rear elevational view taken along lines 2-2 of Figure 1;

Figures 3 and 4 are sectional views taken along lines 3-3 and lines 4-4 of Figure 2 respectively;

Figures 5 to 12 illustrate details of the locking device;

Figures 13 to 16 illustrate alternative details;

15 Figures 17 and 18 are details of another embodiment of the invention;

Figure 19 is a plan view of yet another embodiment of the invention;

Figures 20 and 21 are sectional views taken along lines 20-20 and lines 21-21, respectively, of Figure 19;

20 Figure 22 is a plan view of the locking device of Figure 19 shown in its released position;

Figures 23 and 24 are sectional views taken along lines 23-23 and lines 24-24, respectively, of Figure 22;

Figure 25 is a plan view of the locking device of Figure 19 shown in its locked position; and

25 Figures 26 and 27 are sectional views taken along lines 26-26 and lines 27-27, respectively, of Figure 25.

The locking device 1 illustrated in Figures 1 to 16 of the accompanying drawings is designed for fitting to the latch bar of a door latch inset within the body of a door between opposite sides of the door. The latch bar is of square  
30 cross section and projects from opposite sides of the door and a normal door

handle is fixed to the end of the latch bar at one side of the door and the locking device is fitted to the end of the latch bar on the opposite side to permit the door to be locked from that side. As is conventional, the latch includes a spring loaded latch bolt which is resiliently urged into a projecting position for engaging a catch on the door frame so as to latch the door in a closed position. The latch bar is coupled to the latch bolt by a conventional latch mechanism which operates to retract or withdraw the latch bolt into the latch casing and disengage it from a cooperating door catch, in response to turning of the latch bar, so as to permit the door to be opened.

Referring to Figures 1 to 12, the locking device 1 comprises a cast metal housing or escutcheon 2 in which is journaled a door handle 3. This door handle comprises a generally conical body 4 from the outer end of which projects a lever arm 5 by which the handle may be manually turned. The opposite end of the body 4 has a cylindrical part 6 of reduced diameter compared to the diameter of the adjoining part of the body. This reduced diameter part 6 projects into the housing 2 through a suitable hole in the housing and is journaled in an annular collar 7 projecting from the housing, about the hole, by means of a sleeve 8 (see also Figure 8). The sleeve has an annular flange 9 projecting between and in abutting relation with both the free end of the collar 7 and the body 4. It is prevented from turning in the collar by grooves 10 of the sleeve 8 engaging cooperating ribs 11 (Figure 12) projecting from the inside of the collar 7. The sleeve has first and second pockets 12,13 spaced circumferentially about its inner periphery for engaging a dome shaped detent 14 mounted in the cylindrical part 6 of the handle for indexing the handle in the rest and locked positions, respectively.

The detent is mounted in a socket 15 (Figures 4 and 7) in the cylindrical part 6 and is spring biased towards the surrounding sleeve 8. The handle 3 is secured to the housing 2 by means of a circlip 16 fitted to the cylindrical part 6 of the body 4 and abutting the inside of the housing.

The handle body 4 has a blind passageway 17 extending into the

body from the inner end thereof opposite the lever arm 5 and fitting onto the adjacent projecting end of the latch bar 18 (shown in chain dotted lines on Figure 5). The passageway 17 has an internal profile formed from specially designed longitudinally extending ribs 19 which are arranged so as to enable  
5 the handle to engage and turn the square section latch bar, when the handle is turned in a clockwise direction from the rest position, and enable the handle to turn relatively to the latch bar when the handle is turned in an anti-clockwise direction from the rest position.

Disposed in the housing 2, adjacent the inner end of the part 6 of the  
10 handle body 4, is an annular cam or locking bush or member 20 (see also Figure 9) which has a collar 21 projecting from its end opposite the part 6 and journaled in a suitable hole in a base plate 22 attached to the housing 2. The locking bush is rotatable relative to the housing and base plate and has a central, square aperture 23 for engaging the latch bar and a locking notch  
15 or recess or detent 24 in its periphery.

Cast on the inside of the housing 2, adjacent its periphery, is a locking bar guide 25 (see Figures 10 and 11) which is in the form of a channel that is radially disposed to the axis of rotation of the handle 3. The guide mounts a locking bar or member 26 which is slidable radially in the channel and is  
20 spring biased towards the locking bush 20 and the cylindrical part 6 of the handle body 4. The locking bar includes a protrusion 27 which is slidable in a guide slot 28 in the base plate 22 and aligned with the locking bar guide 25.

The inner end of the cylindrical part 6 has a cam surface formed on its periphery for controlling movement of the locking bar. At its radially inner  
25 end the locking bar has a cam follower portion 30 in engagement with the cam surface and the latter includes a camming recess 31 which, when the handle 3 and cylindrical part 6 are turned to a predetermined locking position, permits the locking bar to clip into engagement with the notch 24 in the locking bush 20. One end 32 of the camming recess serves as a stop  
30 which engages the cam follower portion 30 of the locking bar 26 to prevent



further turning of the cylindrical part 6 and handle 3 once the locking bar is engaged with the notch 24 in the locking bush 20 and the opposite end 33 of the camming recess is inclined or ramped to facilitate disengagement of the locking bar from the notch when the handle is turned in the opposite  
5 direction.

The housing 2 of the locking device 1 is attached to one side of a door by means of screws, with the passageway 17 of the handle body 4 engaged with the latch bar 18. Holes 34 are provided through the wall of the housing and in the base plate 22 for these screws.

10 The handle 3 maybe a JPS Raven handle or equivalent. The housing 2 may be a zinc alloy coating, the sleeve 8 may be of nylon and the detent 14 may be of brass. The base plate 22 may be stamped from steel plate and may have a thickness of 1.5mm.

When the handle 3 of the locking device 1 is in its rest position shown  
15 in Figure 2, the locking bar 26 is aligned with the notch 24 in the locking bush 20 but is prevented from being urged into engagement with the notch by the cam surface on the cylindrical handle part 6. In this position, the detent 14 engages the first pocket 12 in the sleeve 8 to index the handle in its rest position.

20 To open a door fitted with the locking device 1, the lever arm 5 of the handle 3 is turned in a clockwise direction from its rest position, when viewed from the front. When turned in this direction, the ribs 19 of the handle body 4 couple and engage the square section of the latch bar 18 so that the latter turns with the handle and, hence, the latch bolt is retracted  
25 allowing the door to be opened. At the same time, the locking bush 20 also rotates with the latch bar. The turning of the handle body 4 causes the detent 14 to disengage from the first pocket 12 in the sleeve 8. When the lever arm 5 is released, the latch bar turns under the action of the latch spring in an anti-clockwise direction causing the handle 3 and locking bush  
30 20 to return to the rest position where the detent 14 re-enters the pocket 12

to index the handle in this rest position.

To lock the door, the handle 3 is lifted upwardly from its rest position, in an anti-clockwise direction. In this direction of rotation, because of the design of the ribs 19, the handle turns relatively to the latch bar 18 and locking bush 20. The turning of the handle causes the detent 14 to disengage from the first pocket 12. As the handle body 4 rotates, the camming recess 31 moves into contact with the cam follower portion 30 of spring loaded locking bar 26 enabling the latter to fall into engagement with the notch 24 in the locking bush 20 which, in the indexed rest position of the handle, is aligned with the locking bar 26 thereby locking the latch bolt in its extended position. As the door locks, the detent 14 engages the second pocket 13 to index the handle in this locked position. Further anti-clockwise movement of the handle is positively prevented by the cam follower engaging the stop side 32 of the cam recess 31. The latch bolt is, thus, firmly locked against turning, preventing operation of the latch from the opposite side of the door. The door is thus locked. Returning the handle clockwise to its rest position reverses the movement described above. The inclined side 33 of the camming recess 31 eases the locking bar 26 radially outwardly from the body 4 in response to the latter being turned and causes the locking bar to disengage from the locking bush 20, thereby releasing the latch bar so that it can be turned from the opposite side of the door.

In a modification shown in Figure 13 (which is similar to Fig. 7), the passageway 17 in the cylindrical part 6 of the handle has an internal profile formed from an alternative arrangement of longitudinally extending ribs 61.

In another modification shown in Figures 14 and 15, the locking device includes a dog clutch 35 having two halves 36,37. The first clutch half 36 has a square shaped aperture 38 and the latch bar engages within the aperture so as to couple the first clutch half to the latch bar. This first clutch half replaces, or is fixed to, the locking bush 20. The second clutch half 37 is attached to the inner end of the handle body and has a circular shaped

aperture 39 through which the latch bar freely projects. The latch bar is also freely rotatable within the handle body passageway.

Each half of the clutch has a pair of lugs 40 which respectively abut against the lugs 40 in the opposing clutch half when the locking device is in its rest position. When the handle is turned clockwise from its rest position, the engaged lugs cause both halves 36,37 of the clutch to rotate, which turns the latch bar 18 to retract the latch bolt. When, however, the lever arm is turned anti-clockwise from the rest position, the pairs of lugs are disengaged, thereby allowing the handle to turn relative to the latch bar and the locking block to move into locking relation with the latch bar under control of the cam member.

In yet another modification shown in Figure 16, the locking device includes a circular plate 41 which has a pair of opposing arcuate slots 42 engaged by a pair of pegs 43. The circular plate has a square shaped aperture 44 within which the latch bar 18 engages so as to couple the circular plate to the latch bar. This circular plate replaces, or is fixed to, the locking bush 20 of the first embodiment. The pegs project from the inner end of the handle body which is freely rotatable relatively to the latch bar. When the handle is turned clockwise from the rest position, the pegs are forced against the ends of the arcuate slots 42, causing the latch bar 18 to rotate. When, however, the handle arm is turned anti-clockwise from the rest position, the pegs travel freely along the slots enabling the handle to turn relative to the latch bar.

An advantage of the above described embodiment is that the locking device can be easily attached to one side of a door, replacing any existing door handle arrangement on that side of the door. The door handle arrangement on the other side of the door need not be changed. The locking device does not require a receiving cavity to be chiselled into the body of a door between opposite sides of the door or any other form of carpentry work to be performed.

Moreover, the operation of the locking device is simple. With the door

closed, the handle of the locking device is turned upwards, for example, through 45°, and this locks the latch bar extending through the door and, hence, the latch. The door cannot then be opened from the opposite side. However, in the case of emergency, such as a fire, the door is simply and quickly opened by the normal method of pulling the handle down. Practical tests have shown that it is far quicker to operate than any other form of lock, whether this be a key or bolt, and there is no fumbling in the case of panic as it is the natural way to open the door.

In a second embodiment shown in Figure 17, the cylindrical part 6 of the handle has a blind, rectangular section passageway 62 extending into the handle body for fitting to the latch bar 63 which has an external profile defined by the bar being hexagonal in cross-section. This enables the handle to engage and turn the latch bar 63, when the handle is turned in a clockwise direction from the rest position, and enables the handle to turn relatively to the latch bar when the handle is turned in an anti-clockwise direction from the rest position.

In a modification shown in Figure 18 to the second embodiment, the hexagonal section latch bar has been replaced by a latch bar 64 which has an external profile defined by the bar being "S" shaped in cross-section.

Figures 19 to 27 illustrate a third embodiment of the invention which essentially consists in a modified door rim latch very similar to those in current use and which is intended to be inset within the body of a door between opposite sides of the door. In this embodiment, instead of a latch bar of square cross section extending through the latch and the door, the latch bar is split into first and second coaxial latch bar members 44,45 each projecting from one side of the door and having a lever door handle 46,47 fitted thereto for turning the latch bar member. The two handles are suitably journaled and operate independently of one another. The latch includes a latch bolt 48 which is resiliently urged into a latching position by a compression spring 49. The latch bolt has a hollow latch body 50 formed as

a pressing and having a solid nose 51 for engaging a co-operating catch on the door frame. The latch bar members project into the latch body and each member has a cam 52,53 attached to its end projecting into the body. These cams control movement of the latch bolt and each cam has an accurate flange 54,55 projecting from the cam about part of its circumference. The cam flanges are arranged to engage a slot 56 in the top part 57 of the body 50 of the latch bolt and, in the rest position illustrated in Figures 19, 20 and 21, where the latch bolt is urged into engagement with its co-operating catch by the compression spring 49, the radial edges of the flange are in contact with the body 50 and the handles are horizontal. The cam flange associated with at least one of the handles is formed with an additional lug 58 at the peripheral end of the flange opposite that engagable with the end of the slot 56 which, when the latch bolt is in its extended, latching position can engage with a co-operating slot 59 in the bottom part 60 of the latch body. When the latch is in its latching position, turning of the relevant latch handle 46 or 47 in an anti-clockwise direction moves the associated cam flange 52,53 so as to engage the lug 58 with the slot 59 and prevents the latch bolt from being retracted.

Hence, if either handle is turned, for example, through 45°, in this case, downwardly from the rest position, either cam operates the latch, by means of its accurate flange actuating the latch body, and opens the latch bolt 50 in a normal manner, as shown in Figures 22, 23 and 24. However, if the handle with the locking lug is moved through 45° anti-clockwise from the rest position, its cam lug 58 engages in the slot 59 in the bottom of the latch body, as illustrated in Figures 25, 26 and 27, and prevents the latch from being retracted if any attempt is made to move the other door handle. The door is thus locked. The non-locking side of the door has a handle which will not move from the horizontal position in an anti-clockwise manner so that a door can only be locked from one side.

Whilst particular embodiments have been described it will be

understood that various modifications may be made without departing from the scope of the invention as defined by the appended claims. For example, the locking device could be easily adjusted to be operated by a left-handed lever arm instead of a right-handed lever arm. The direction of rotation of the lever arm can be reversed to lock or open the door respectively. The lever arm may be replaced by a knob. The components of the locking device may be made of any suitable material. In the last described embodiment, a catch may be used to retain or index the first handle in place in order to lock the door from the opposite side.

CLAIMS

1. A locking device (1) for a door latch in which a latch bar (18) of the door latch mechanism is turnable to retract a latch bolt of the latch mechanism, characterised by locking means adapted to be actuated in response to turning of a door handle (3) for the latch mechanism in one direction so as to lock the latch bolt in its extended latching position, whereafter the locking means is releasable by turning the handle in the opposite direction.
2. A locking device as claimed in claim 1, wherein the locking means, in its actuated, locking position, is arranged to act on the latch bar (18) to prohibit turning of the latch bar.
3. A locking device as claimed in claim 2, wherein the locking means includes means (20) turnable with the latch bar (18) and engagable to prohibit turning of the latch bar in response to turning of the handle (3) in said one direction, and which is disengaged by turning the handle in said opposite direction.
4. A locking device as claimed in claim 3, wherein the locking means includes a slidable locking member (26) controlled by cam means turnable with the handle (3).
5. A locking device as claimed in claim 4, wherein the means turnable with the latch bar includes detent means (24) associated with the latch bar (18), and the slidable locking member (26) is engagable with the detent means for locking the latch bar against turning.
6. A locking device as claimed in claim 5, wherein the detent means (24) is disposed on a rotatable locking member (20) adapted to be mounted on the latch bar (18) so as to turn therewith.
7. A locking device as claimed in claim 5 or 6, wherein the cam means is profiled to prevent the slidable locking member (26) from engaging the detent means (24) when the cam means is turned in said opposite direction whilst permitting the slidable locking member to engage the detent

means when turned in said one direction.

8. A locking device as claimed in claims 5, 6 or 7, wherein the cam means has a recess (31) which permits the slidable locking member (26) to move into engagement with the detent means (24), said recess  
5 having a stop portion (32) at one end which prevents the cam means and handle (3) from turning further in said one direction upon engagement of the the locking member in the recess, and a ramp portion (33) at its opposite end to ease the locking member from the recess when the handle and cam means are turned in the opposite direction.

10 9. A locking device as claimed in any one of claims 4 to 8, including a rotatable door handle (3), with the cam means integral with the handle.

10. A locking device as claimed in any preceding claim, including means (16,17,19) for coupling the handle to the latch bar (18), said coupling  
15 means enabling the handle to turn relatively to the latch bar, when turned in said one direction, and to turn the latch bar when turned in said opposite direction.

11. A locking device as claimed in claim 10, wherein the coupling means comprises a passageway (17) in the handle by which the handle is  
20 fitted to the latch bar (18), said passageway having an internal profile which enables the handle to turn relatively to the latch bar, when turned in said one direction, and to turn the latch bar when turned in said opposite direction.

12. A locking device as claimed in claim 10, wherein the coupling means comprises a passageway (62) in the handle of rectangular cross-  
25 section and be fitting to the latch bar (63,64) and wherein the latch bar has an external profile which enables the handle to turn relatively to the latch bar, when turned in said one direction, and to turn the latch bar when turned in said opposite direction.

13. A locking device as claimed in claim 1, including means for  
30 coupling the handle to the latch bar (18) wherein the locking means



comprises a first part (37,40;43) associated with the handle and a second part (36,40;41) turnable with the latch bar, so that when the handle is turned in said one direction, the coupling parts are disengaged and, when the handle is turned in said opposite direction, the coupling parts engage so that  
5 the latch bar rotates in the same direction as the handle.

14. A locking device as claimed in any preceding claim, wherein the handle (3) is rotatably mounted in a housing (2) for securing in a fixed position relative to the latch mechanism.

15. A locking device as claimed in claims 4 and 14, wherein said  
10 slidable locking member (26) is mounted in said housing (2).

16. A locking device as claimed in any one of claims 1 to 3, wherein the latch bar is split and comprises first and second coaxial latch bar members (44,45) for projecting from opposite sides of a door having said latch, the locking means comprising actuating members (54,55) on said  
15 latch bar members, the actuating members being engageable with the latch bolt, whereby at least one of the latch bar members is rotatable in said one direction to cause its actuating member to engage the latch bolt and prohibit retraction thereof by turning of the other latch bar member.

17. A locking device as claimed in any preceding claim, including  
20 indexing means (14) for indexing the door handle (3) alternatively in either of two positions in one of which the latch bolt is locked in its extended latching position, and in the other of which the latch bolt is unlocked.

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FIG. 1

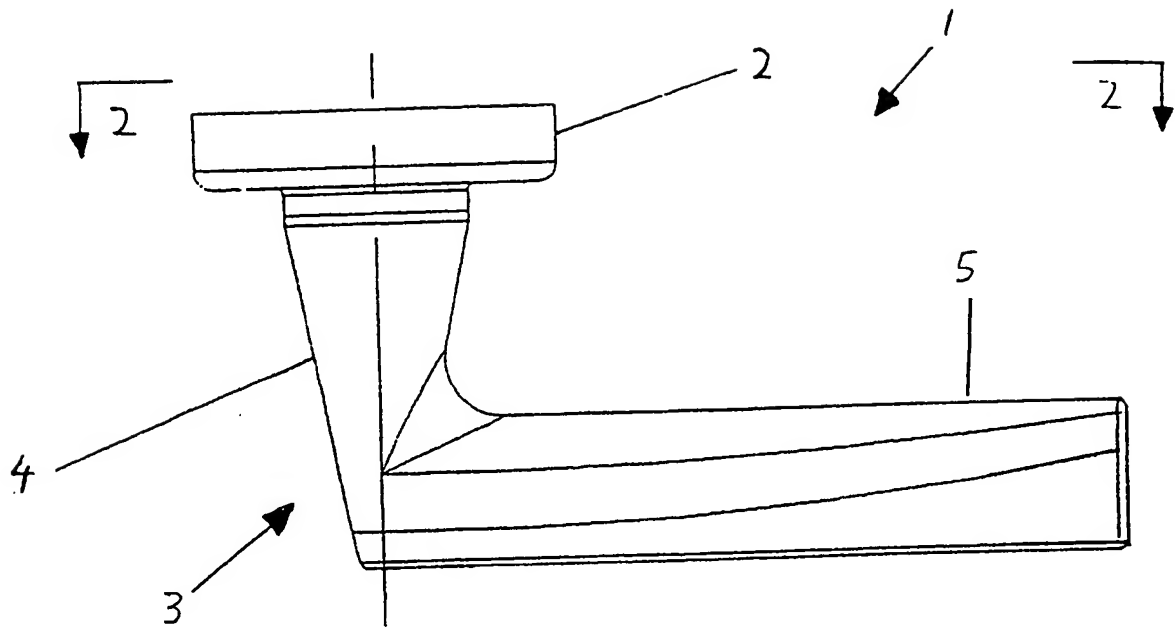
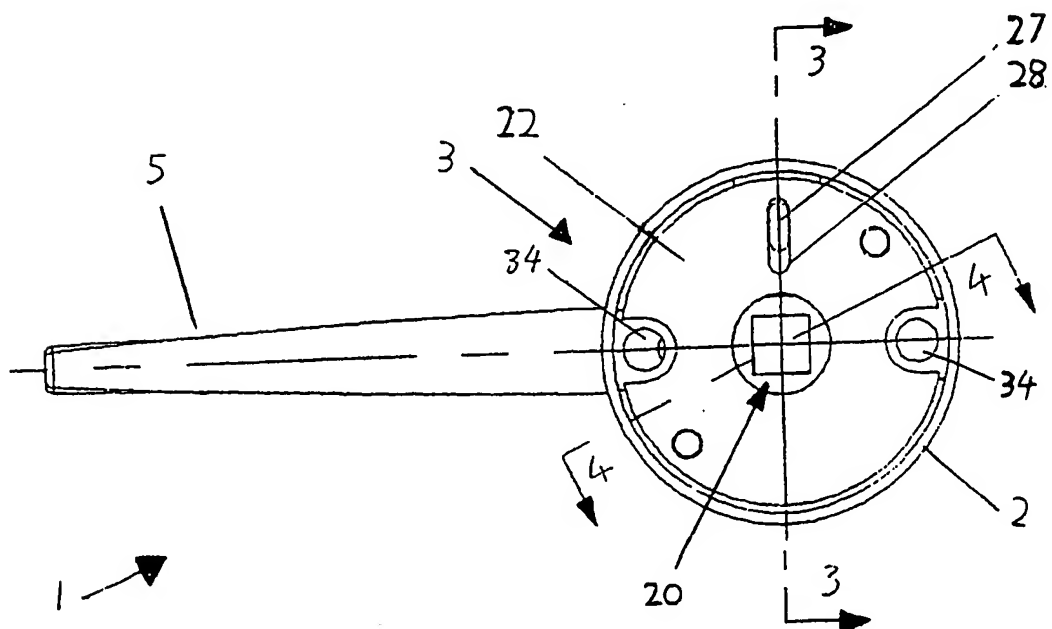


FIG. 2



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FIG. 3

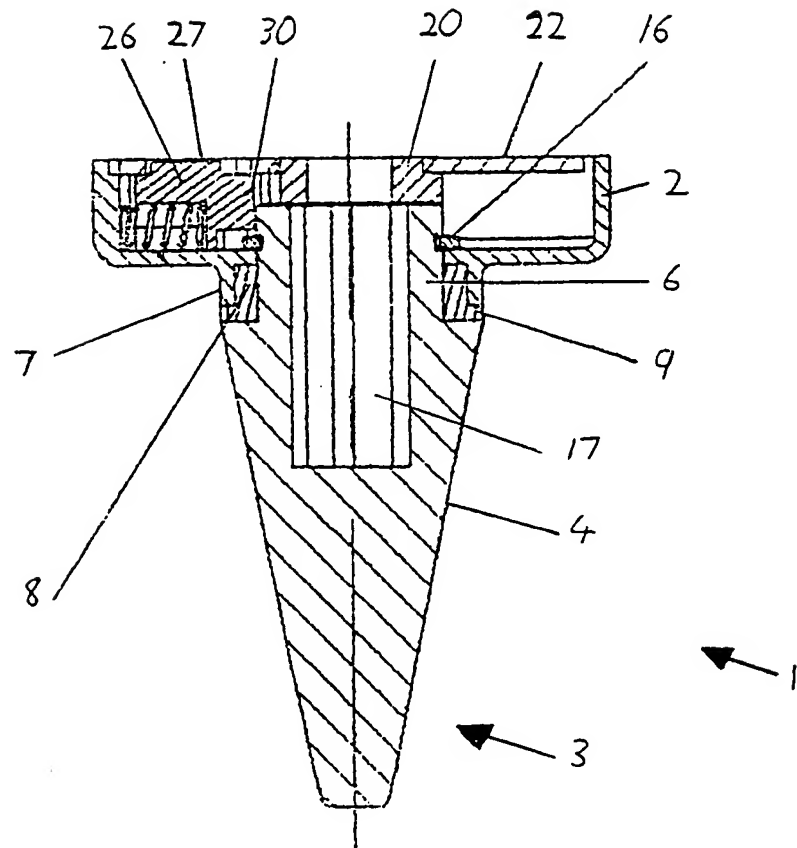


FIG. 4

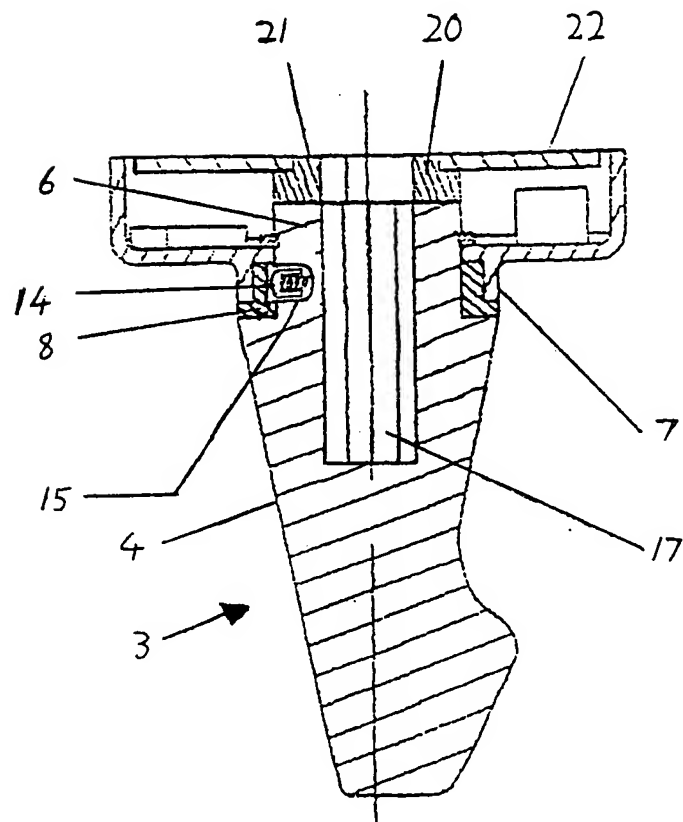


FIG. 5

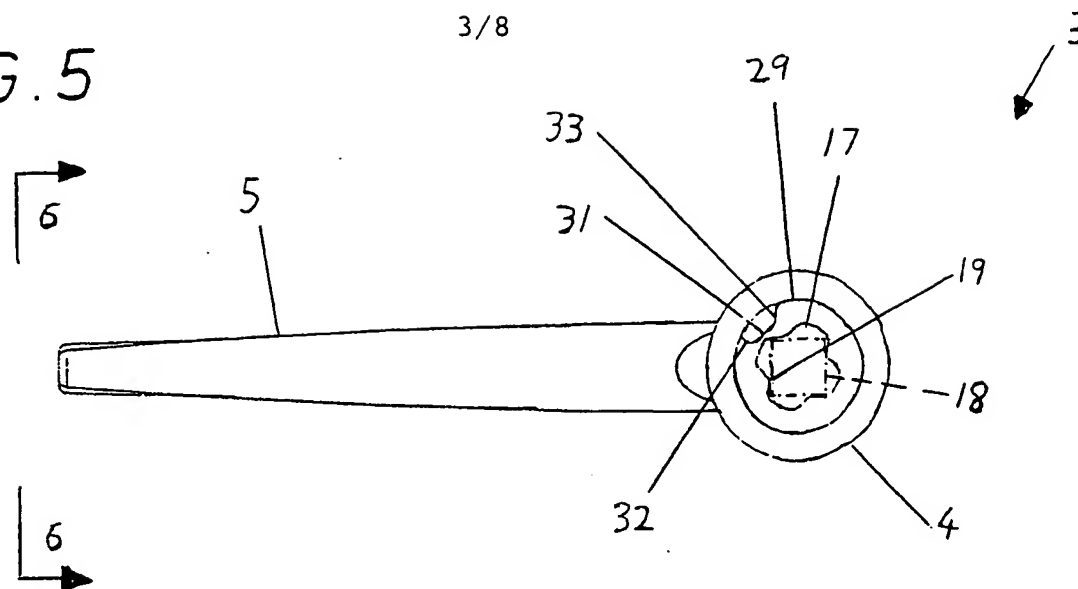


FIG. 6

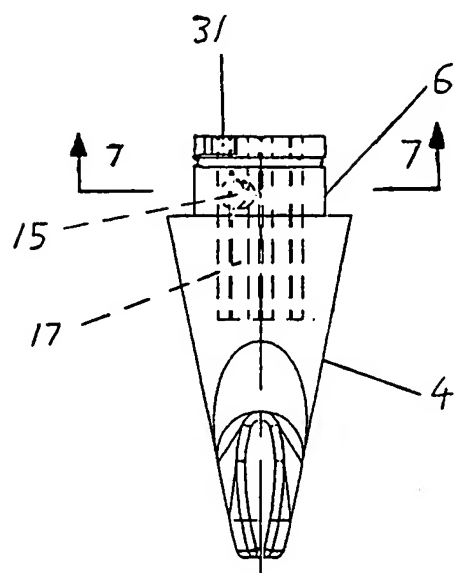


FIG. 7

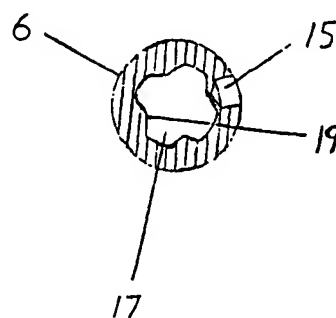


FIG. 8

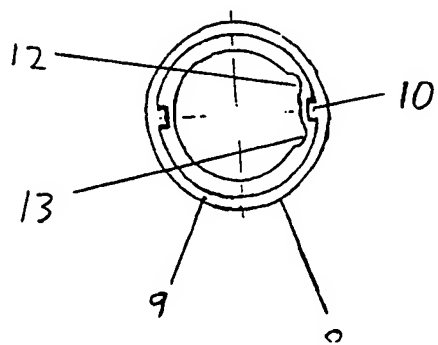


FIG. 9

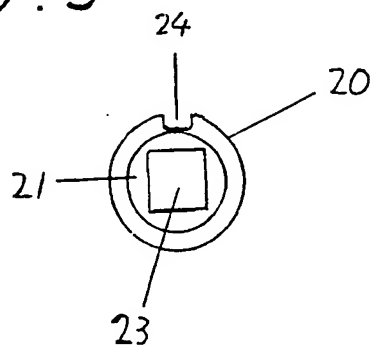


FIG.10

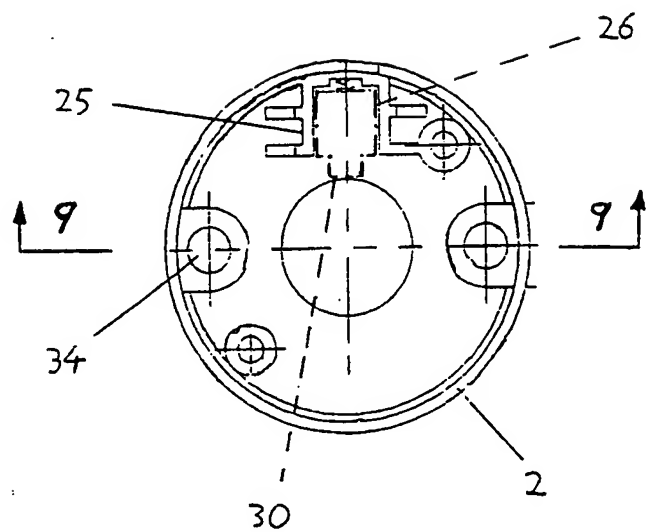


FIG.12

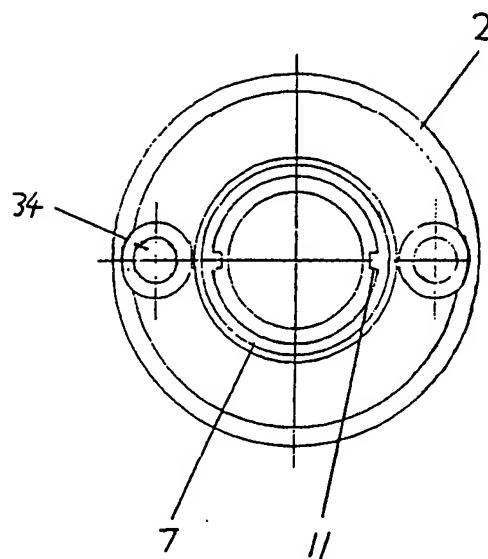


FIG.11

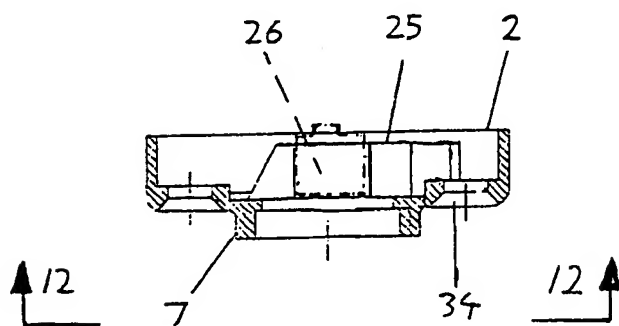


FIG.13

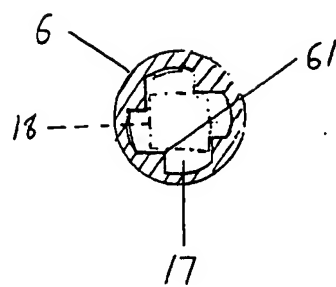


FIG.14

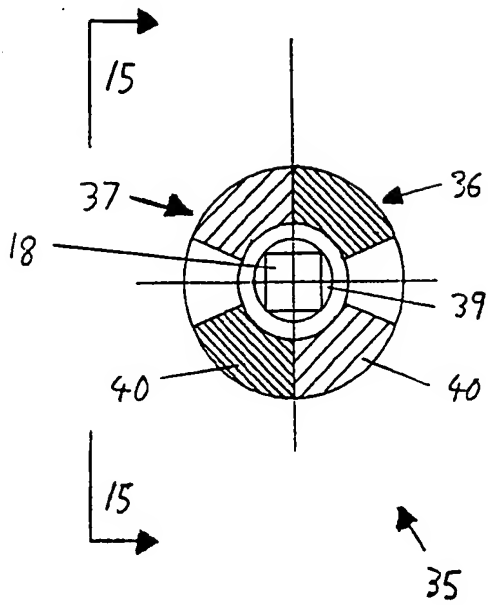


FIG.15

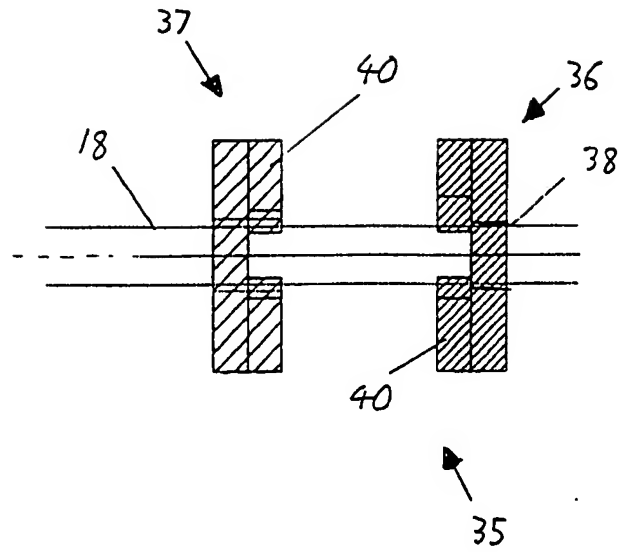


FIG.16

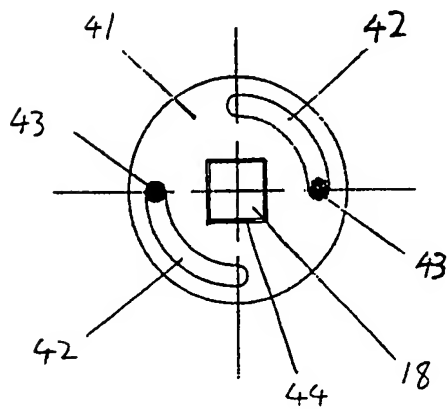


FIG.17

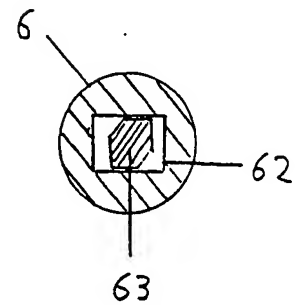
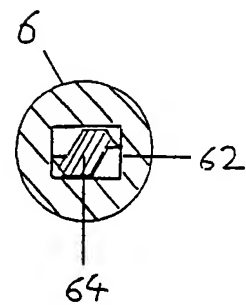


FIG.18



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FIG.19

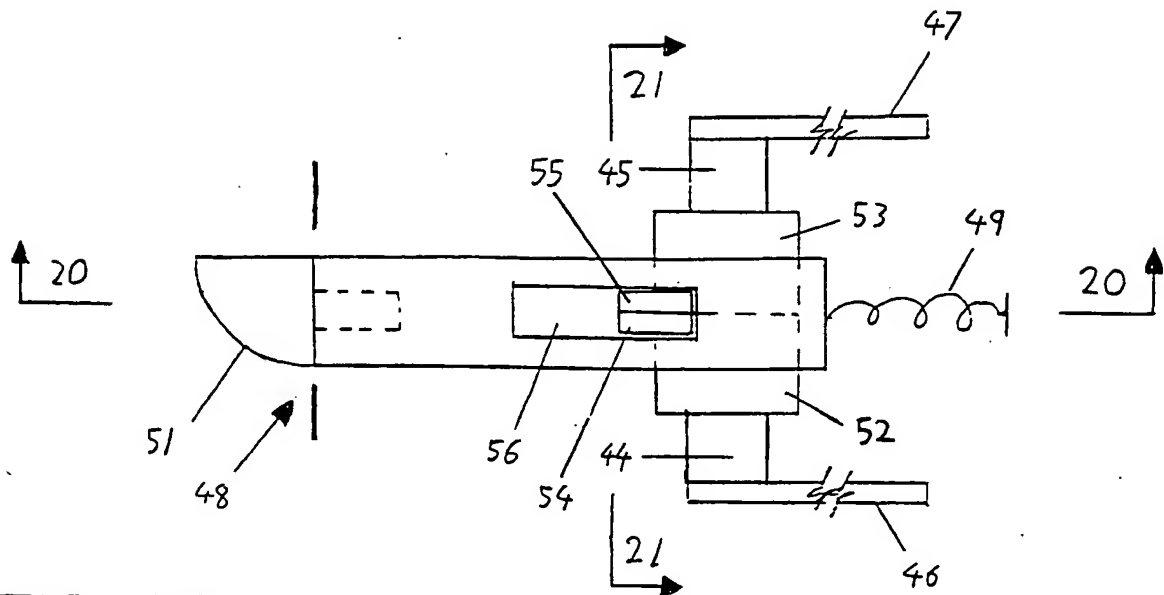


FIG.20

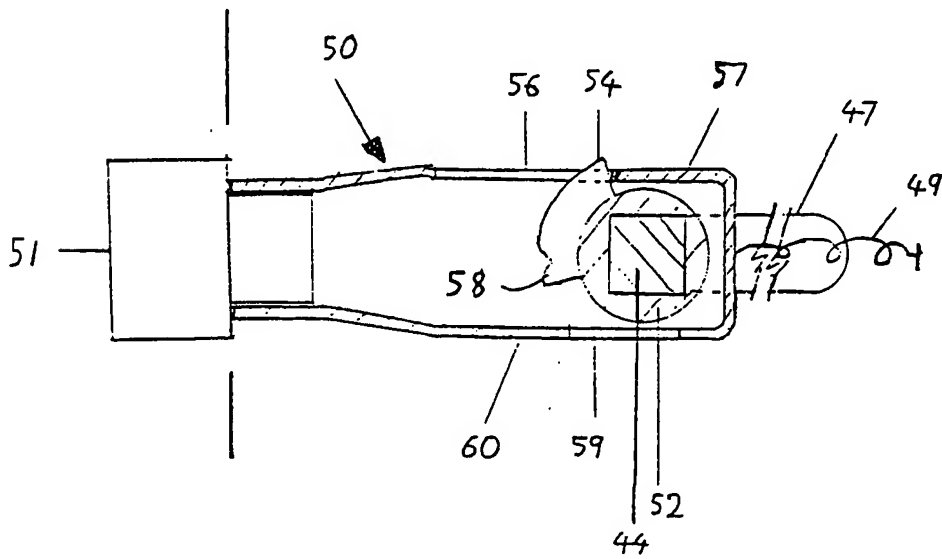
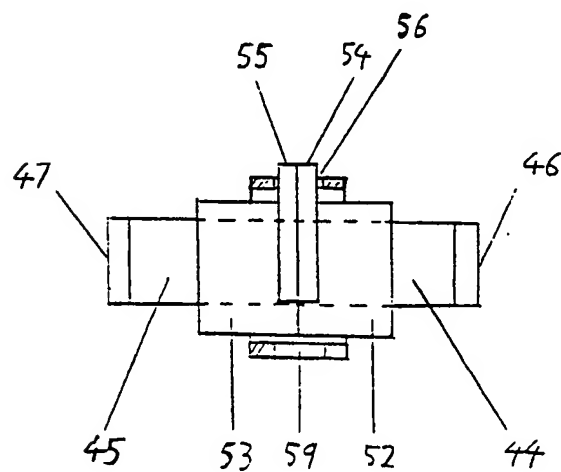


FIG.21



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FIG. 22

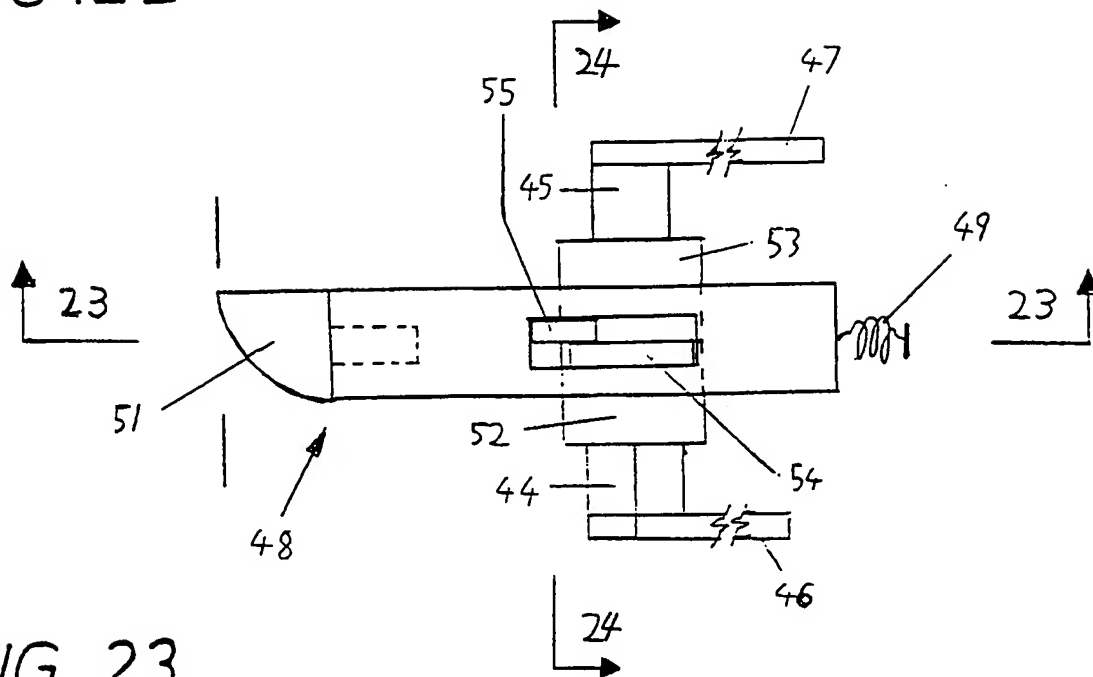


FIG. 23

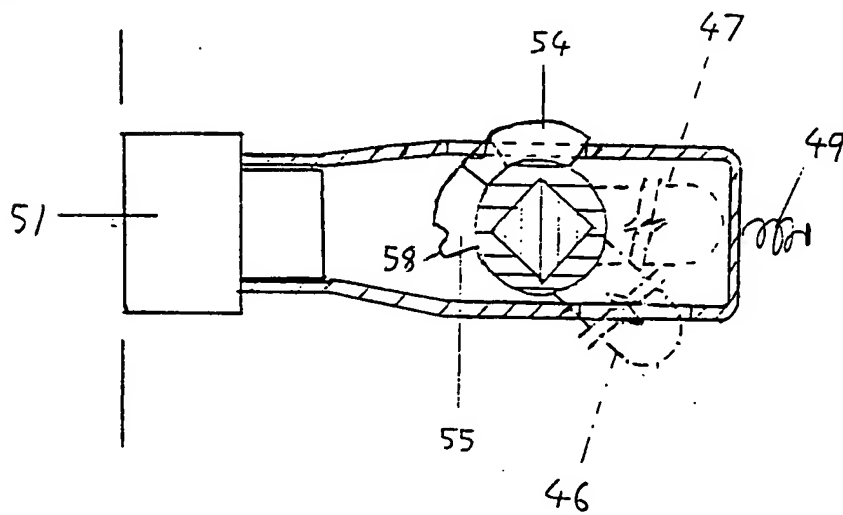


FIG. 24

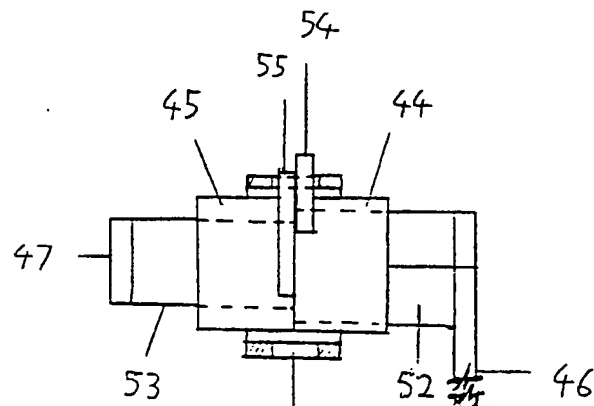




FIG. 25

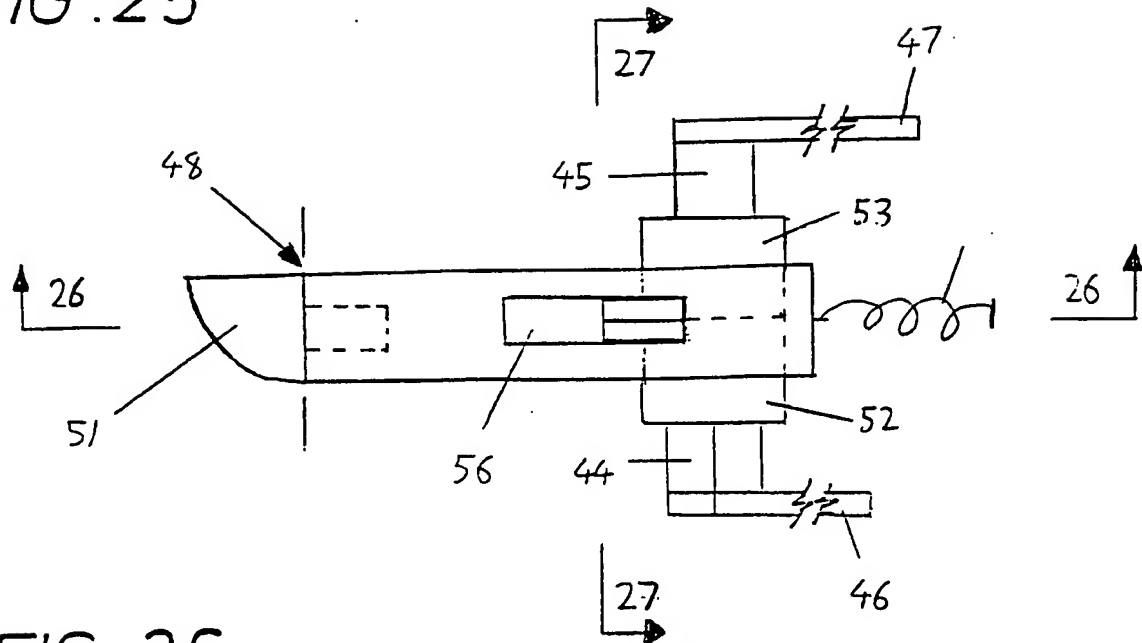


FIG. 26

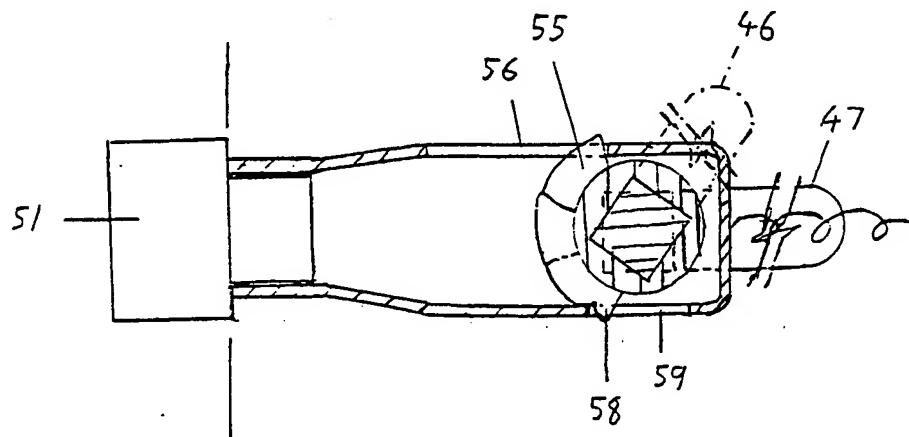
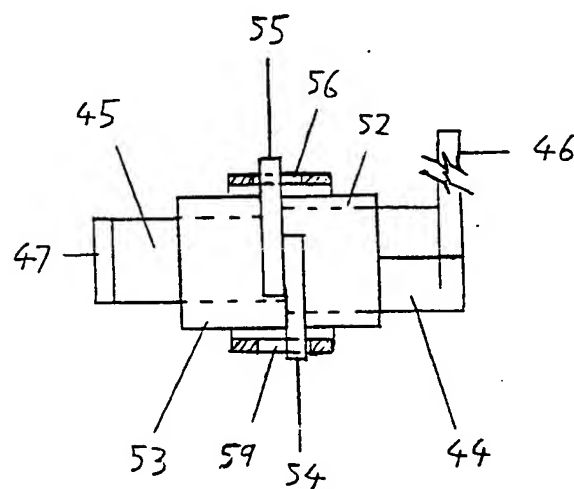


FIG. 27



# INTERNATIONAL SEARCH REPORT

Inter national Application No

PCT/GB 00/01920

A. CLASSIFICATION OF SUBJECT MATTER  
IPC 7 E05B13/00 E05C1/16

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)  
IPC 7 E05B E05C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)

EPO-Internal, WPI Data, PAJ

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

| Category * | Citation of document, with indication, where appropriate, of the relevant passages                             | Relevant to claim No. |
|------------|--|-----------------------|
| X          | US 1 688 240 A (KEIGWIN)<br>16 October 1928 (1928-10-16)   | 1,2,16                |
| A          | the whole document   | 4,7,8,<br>15,16       |
| A          | US 5 433 495 A (UFFNER GARY H)<br>18 July 1995 (1995-07-18)<br>column 2, line 5 -column 5, line 57;<br>figures | 1,13,14,<br>17        |
| A          | CH 565 307 A (GRETSCH UNITAS GMBH)<br>15 August 1975 (1975-08-15)<br>the whole document                        | 1,4,5                 |

☐ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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Date of the actual completion of the international search

29 August 2000

Date of mailing of the international search report

12/09/2000

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Henkes, R

# INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

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| Patent document<br>cited in search report |   | Publication<br>date | Patent family<br>member(s) | Publication<br>date |
|---|---|---------------------|----------------------------|---------------------|
| US 1688240                                | A | 16-10-1928          | NONE                       |                     |
| US 5433495                                | A | 18-07-1995          | NONE                       |                     |
| CH 565307                                 | A | 15-08-1975          | NONE                       |                     |